by Cheerie R. Patneaude

small test facility nestled in the San Augustine Mountains in southern New Mexico celebrated 40 years of continuous contribution to the nation's space program on Saturday, Sept. 18. The first rocket engine was tested at the White Sands Test Facility (WSTF) on Sept. 22, 1964. Five years later, on July 20, 1969, Neil Armstrong and Buzz Aldrin landed on the Moon using the propulsion systems tested and qualified for human spaceflight at WSTF.

On July 6, 1962, WSTF was chosen as the site for the Johnson Space Center Propulsion Systems Development Facility. This site was chosen for its isolated location and topography, which minimized the inherent hazards of aerospace propulsion testing to the general population. More than 310 engines have been tested to date, for a total number of firings exceeding 2.1 million.

Although originally built to support propulsion tests, WSTF soon expanded to test materials to verify their suitability for use in spacecraft construction. WSTF currently does extensive testing for other NASA centers; for other government agencies including Army, Air Force, Navy, Department of Energy and Department of Transportation; and for aerospace-related commercial industries on a reimbursable basis.



Ralph Rocha, technician, unpacks the first Service Propulsion System engine to be tested at WSTF in 1964.



A chemical steam generator provides long-duration vacuum environment for rocket engine firings at three test stands.

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volume

SPACE CENTER ROUNDUP

Lyndon B. Johnson Space Center



A matter of Destiny

Cosmonaut Gennady I. Padalka (left), Expedition 9 commander, and Astronaut Edward M. (Mike) Fincke, NASA ISS science officer and flight engineer, pose for a crew photo in the Destiny laboratory of the International Space Station. The Destiny lab houses removable racks for crew support and scientific research experiments. Read about the roles that the Human Research Facility Training Team and Stowage Group play in helping to prepare each crew to perform experiments on orbit.

See articles on pages 6 – 9.



Beak Sends...

A MESSAGE FROM CENTER DIRECTOR LT. GEN. JEFFERSON D. HOWELL JR.



Inspiration

Have you ever thought about whom inspired you as a youth? A parent? A teacher? A coach? An astronaut?

In his compelling book, "Flags of Our Fathers," James Bradley describes the lives of the six young men who raised the American flag on Mt. Suribachi during the battle for Iwo Jima. The photograph of that flag raising is one of the most famous in modern times. James' father, John Bradley, was one of those men. James felt driven to do the research that led to the book because his father would never talk about his combat experiences.

James did not find out until after his father's death that John had been awarded the Navy Cross for Gallantry for his heroics as a Navy Corpsman in that bloody battle, the bloodiest in WWII. As he grew up in Antigo, Wis., James was continuously reminded by teachers, friends and prominent local citizens that his father was a hero and an inspiration to them.

Whenever he asked his father about his celebrity, the only response was, "The real heroes did not come back." John Bradley, without fanfare, lived the rest of his life setting the example in being a loving husband and father, as well as an admired businessman and civic leader of his community. The success of his children and those who emulated him attest to the positive influence he had on others.

Whom are you inspiring? Have you thought about it? Being associated with NASA and human spaceflight puts you and me into a very important, and to many, an elite group. Because of who you are and what you do, you have an influence on a lot more people than you might imagine. Whether it's your children, your nephews and nieces, the neighbor kids, your fellow workers or the bag boy at Kroger, there are a lot of folks out there who think you are special, who are watching you and who want to be just like you.

What kind of example are you setting for others? Are you the kind of person that you would like someone else to rival? We all need to consider these questions as we go about our daily lives and strive to improve our culture.

Jeffen Housel

IT'S GREAT TO BE ALIVE AND IN HOUSTON!

Students "ASPIRE" to tell NASA's story

by Gary Kitmacher

When it comes to International Space Station outreach, NASA really means business.

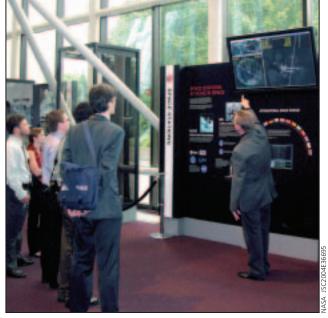
NASA Means Business is a competition designed to capture the interest of students in fields such as business and communications and channel their knowledge to help tell the Space Station story to everyday people in new and more effective ways. It is a grant program sponsored by the International Space Station Program, the Space Operations Mission Directorate of NASA Headquarters and the Johnson Space Center Education Office.

Students participating in NASA Means Business develop a promotion plan, an outreach plan and a public service announcement. The focus is on the Space Station's role as a bridge to Mars, technology development, research opportunities, international cooperation and future exploration. The final presentations were judged at JSC in May.

"What impressed me most as a NASA Means Business judge was how a group of students from various cultural backgrounds and educational interests, beginning with little to no insight into the day-to-day workings of NASA, intelligently conquered the learning curve and successfully collaborated," said NASA Means Business judge Roger Weiss, technical integration specialist with Science Applications International Corporation. "They produced some highly insightful, creative, thought-provoking and very effective public service announcements and promotion plans."

In February, student and faculty representatives from the five finalist teams – the University of New Hampshire, Georgia Tech, the University of Texas-Corpus Christi, San Jacinto College South Campus and ASPIRE from Arizona State University/Art Institute of Phoenix – visited JSC for several days. They received orientations on human spaceflight, the International Space Station Program and JSC from Bill Gerstenmaier, ISS Program Manager, Wendell Mendell of the Solar System Exploration Division and several others. The teams visited again in May for their final presentations, and the Arizona-based team was selected as the national winner.

The team was called ASPIRE, which stands for Arizona Students Present Interesting Research to Everyone, and consisted of more than 60 students and several faculty members from Arizona State and the Art Institute of Phoenix. The two schools had a multidisciplinary group of engineering, business management and communications students.



ASPIRE students are shown the new International Space Station exhibit at the Smithsonian National Air and Space Museum by Roger Launius.

"The best part of the NASA Means Business program was bringing together students from non-science and engineering backgrounds who were interested in space but never felt that they could be part of NASA," said ASPIRE Program Manager Lisa Tidwell. "This gave them an opportunity to use their creative minds in production, graphic design and communication campaigns."

"This is an enormously positive educational experience," Weiss said.

In July, ASPIRE representatives visited Washington, D.C., where they were able to present their work to Associate Administrator for Space Operations Bill Readdy, the Mission Operations Directorate and NASA Administrator Sean O'Keefe. The students were also interviewed for the National Space Society cable TV program "Around Space" and toured NASA TV facilities, the Smithsonian National Air and Space Museum and the newly opened Udvar Hazy Center at Dulles in Virginia.

"It was truly rewarding to see how well received our ideas were by the Agency, especially at Headquarters," Tidwell said.

NASA Means Business public service announcements are already appearing on NASA TV, and will be offered to network television.

by Amiko Nevills

JSC boosts small businesses for future technologies through Space Alliance

FINDING SOLUTIONS to reduce weight is second nature to innovators for space. Before America could venture into space to explore the universe, NASA needed to lighten its

load. Engineering ingenuity slimmed down computers, cameras, life-support systems and critical hardware to propel spacecraft and their special cargo into space.

So when Mission Technologies Inc. sought for a smart way to reduce the weight of a reconnaissance aircraft launcher, it's no surprise that tinkering minds behind the U.S. space program had the answer.

Mission Technologies, a small business in Texas, had developed an uncrewed aerial vehicle system that could transmit realtime intelligence and surveillance data in wartime to field commanders and ground personnel. There was only one problem - a technical problem.

Before it could become a product in practice by the U.S. Department of Defense, the system's launcher, which serves as a miniature runway for the compact aircraft, needed a sleek

Answering the call for help, the Space Alliance Technology Outreach Program (SATOP), a consortium of leaders in space and technology, connected Mission Technologies with Johnson Space Center, one of nearly 50 Alliance Partners today.

SATOP began its trek in 1996 to strengthen the economy within rising communities, pairing small businesses with space-age technology and expertise. The nonprofit program, funded and supported by NASA, now spans four states with chapters in Florida, New Mexico, New York and Texas.

In partnership with JSC, the Texas chapter was established within the Bay Area Houston Economic Partnership (BAHEP) in 1998 and expanded to cover the entire state of Texas in 1999. BAHEP, formerly known as the Clear Lake Economic Development Foundation, strives to stimulate economic growth by moving space technology to private industry.

Sharing NASA knowledge is an investment for technological advances from which the Agency may one day benefit for future exploration.

"Anytime we create an innovative company, it becomes a source for future technology needs for NASA," Harry Erwin, JSC Engineer and NASA Executive on Loan to the Economic Partnership, said.

Erwin, who recently celebrated the anniversary of the lunar landing with fellow JSC "Moon people," experienced first-hand the evolution of technology for space and where it can lead

"We invented our way to the Moon," Erwin said. "Technology luxuries we enjoy today like portable computers and cellular phones came to us from technology need."

Through a cooperative network of engineers and scientists from universities, colleges, NASA field centers and aerospace contractors, including Lockheed Martin, Boeing and United Space Alliance, SATOP offers 40 hours of free technical assistance to small businesses. Participating engineers and scientists in the Space Alliance volunteer their time and creative solutions to overcome barriers to innovation.

"The Alliance Partners drive the SATOP engine," SATOP Executive Director Bob Mitchell, said. "Without the extraordinary knowledge and expertise that they freely share with inventors and entrepreneurs, the SATOP program could not exist."

While small businesses like Mission Technologies get a nudge in solving technical challenges to their next breakthroughs, scientists and engineers of the Alliance Partners exercise their leadership on the space front and gain networking opportunities to launch new ideas.

JSC Acting Chief of the Electronic Design Branch Mike Cooke recently began working with Houston-based CavCom, a company that specializes in two-way communication earpieces. The earpieces with built-in speakers and a microphone provide a way to communicate in high-noise environments and, like ear plugs, protect hearing.

"CavCom came to us through the [SATOP] program to remove the cable from the earpieces to the radio," Cooke said. "Their

challenge happens to match the same challenge we are currently working on with the Wireless Crew Comm Project."

The Wireless Crew Comm Project, a joint venture between Engineering and Space and Life Sciences, aims to transform the audio terminal unit - the phone aboard the Space Station - to

Solving the technical challenge for CavCom could create inroads for future communications in space.

"It's a win-win situation, a perfect match," Cooke said. "Their end product may become valuable for future missions."

Fostering innovation through small businesses not only builds a stronger economy but also serves as a technological path for future space exploration to the Moon, Mars and beyond.

"If we can start enough innovative companies, we can harvest a crop of technologies to take us to Mars," Erwin said.

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systems for the U.S. Department of Defense.

challenge: making the phone aboard the International Space Station wireless.

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Team prepares astronauts for on-orbit health experiments

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by Kendra Phipps

ASA astronauts are many things: doctors, soldiers, pilots, engineers – even veterinarians. But not all of them are trained scientists.

Before a mission, the crew must be brought up to speed on how to correctly perform experiments on orbit and meet the mission's science objectives. When it comes to experiments on how the human body reacts to space, that training is done by the Human Research Facility (HRF) Training Team.

This 10-member team works with the experiments' designers and principal investigators to train astronaut crews.

"We come from education backgrounds," Joyce Schultz, HRF Training Coordinator, said. "We offer guidance to subject matter experts to make their training more efficient."

The HRF is a rack onboard the International Space
Station with instruments designed to support
experiments related to how humans adapt to space. One
HRF experiment, called Advanced Diagnostic Ultrasound in
Microgravity (ADUM), allows Space Station crews to use
ultrasound to check for health problems – without the years of
training it takes to become an ultrasound technician on Earth.





Astronaut Michael Foale, Expedition 8 commander and NASA ISS science officer, balances on the footplate of a special track attached to the Human Research Facility rack in the Destiny laboratory on the International Space Station as part of the Foot Reaction Forces During Spaceflight experiment.

The ADUM instructors make this possible with a special technique: prior to their mission, astronauts are given enough training on the ultrasound machine to use it on themselves or a crewmate. However, as part of the experiment, real-time guidance and image interpretation are done by experts on the ground.

"Some guidance and a little training allows crewmembers to do high-enough quality ultrasound images that somebody on the ground could make the medical diagnosis," Schultz said.

To train the crews quickly on ultrasound, the HRF Training Team arranges for an astronaut to practice with the equipment in the HRF training module in Building 9 while an unseen ultrasound expert communicates with him or her through a headset.

"We reduce training time by using cue cards on the ultrasound machine," said Shannon Melton, ADUM instructor and co-investigator. "The cards guide astronauts to find the correct keyboard buttons and specific points on the body."

ADUM has been performed on orbit: NASA ISS Science Officer Peggy Whitson served as an ultrasound "guinea pig" during her 2002 stay aboard the Space Station.

"I was impressed that even with the slight delay in transferring the video images to the ground, I was able to perform – with guidance from the ground team – imaging of my heart, carotid artery, kidney and bladder," Whitson said. "The remote application of these methods has very positive implications for long-duration spaceflight, as well as potential uses here on Earth."

The training methods vary for other HRF experiments. One of them, the Foot Reaction Forces During Spaceflight experiment,



Pedro Duque, European Space Agency Soyuz crewmember, participates in the Human Research Facility ultrasound proficiency training in Building 9 prior to launching with the Expedition 8 crew in October 2003. Instructor Jessica Meir assists Duque.

investigates how astronauts use specific muscles in space. To track this information, they wear multiple electrodes and angle sensors that monitor the electrical activity of muscles and joints.

"That's one of our more complicated experiments because it involves a lot of equipment and because we train crewmembers to apply electrodes and calibrate the angle sensors," Schultz said. The team has now trained four Expedition crews on the FOOT experiment.

Another experiment, called Pulmonary Function in Flight (PuFF), is designed to help scientists learn more about decompression sickness. Astronauts are at risk of getting this illness, also called "the bends," when transitioning from the Space Station to the different pressure of a spacesuit.

"For the PuFF experiment, training involves having the astronauts become familiar with the hardware and how to set it up, and making them familiar with the in-flight breathing protocol tests," Schultz said.

Results from these HRF experiments are contributing to the Vision for Space Exploration by allowing scientists to study effects of spaceflight on the human body. Not only that, but they also have positive implications for life on Earth: for example, groundbreaking ultrasound techniques are being pioneered with ADUM. These tests in space could improve the health of people on Earth, but they would never get off the ground if not for the preflight work of the HRF

Training Team.

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Precious cargo

Behind the Scenes with the Human Research Facility

Stowage Group

by Catherine E. Borsché

acking for space seems simple enough – that is, to a seasoned business traveler. But for the folks who work each day in the Human Research Facility (HRF) Stowage Group, there is much more in-depth planning, practice and design that goes into packing scientific experiments for the International Space Station.

When a Space Station experiment goes on the drawing board, the HRF Stowage Group enters the design process.

This Critical Design Review gives the group an opportunity to address what the needs are for that particular experiment. They use that information to design the experiment kit that will be used onboard the Space Station.

"We'll start stowage evaluation a little bit before the Critical Design Review for a particular Space Station experiment," Dan Barineau, project manager of the metabolic laboratory operations and stowage support group, said. "Usually by Critical Design Review, we have the design 90 percent complete, and Stowage can come in with a real cohesive assessment. They also have a good concept of how they're going to operate the experiment on Station, which tends to impact how we stow things."

Once the design for the Space Station experiment is in place, prototype experiments must be completed to simulate how the experiment is to be packed on the Space Station. These prototypes also serve to aid in the design of the experiment hardware. Not only does the HRF Stowage group design the kit that the experiment goes into, but they also design the actual

hardware, which can include testing implements and sample containers.

Designing prototype experiment kits requires background work. Once the engineering drawings are in place, the specifications for the experiment are used to produce the desired scale of the prototype. After that happens, the right construction materials must be selected. It is then determined which bonding processes will meet the structural requirements. When the necessary design work is finished, the parts for the prototype must be meticulously cut and assembled

The kits, or stowage bags, are also thoroughly prototyped, usually with simple cardboard. Once all the prototyping is done, it becomes time to make the real kit for flight.

"Once the kit is assigned, we start doing the drawings, making the flight units, and then begin packaging the kit," Silvia Flores, senior packaging engineer, said.

Making the actual kit for the experiment or hardware requires much more than just putting the items haphazardly in a stowage container. There is a lot of rhyme and reason that goes into packing a kit.

The crew has limited time. It's our job to not waste any of it...

"We are asked to make a kit in which the hardware is padded, if necessary, and limited to the size of the allotted drawer in the Space Station," Phillip Good, metabolic laboratory specialist, said. "The kit must be user-friendly and detailed in labeling so that when the astronauts start the experiment, the labeling and the kit are matched to their procedures. Everything comes out of the kit in the most user-friendly method possible."

Most kits designed for the Space Station are made of Nomex material and are either royal blue or white in color. The kits are typically soft and collapsible, so that when the experiment or hardware is no longer in the kit, it can be easily stored using the least amount of space possible. This is crucial for spaceflight, where stowage space is cherished.

The bags and sample containers have received rave reviews from the astronauts using them in space. Sue Dalmeida, metabolic laboratory lead, was one of the chief designers behind the renal stone experiment kit.

"The bag that they used to stow the urine trash kept things as fresh as a daisy – completely odor containing! The urine containment bag also went inside a big Nomex bag with an 11-inch heavy-duty zipper to keep everything sealed tight," Dalmeida said.

The completion of the actual kit does not signal an end to the HRF Stowage Group's involvement.

Flores explains that the kits have to go through a rigorous approval process. Everything about the kit is evaluated, including the way it is stowed, how it is packed, its electrical requirements and its safety components.

The process is involved, but the end product is always of the highest quality.

"We enjoy the challenge of keeping the multitude of competing requirements from destroying the final design's usefulness to the mission," Paul Vincent, packaging engineer, said. "The crew has limited time. It's our job to not waste any of it while they transfer, stow, un-stow, deploy and re-stow the experiment hardware."

Dalmeida said that in their line of work, boredom is never a problem. All experiments and stowage kits are custom-made, so each assignment is essentially a new path to tread.

"This gives you good exposure to the entire range of hardware involvement. In Stowage, you start from nothing," Barineau said. "But in a very short amount of time, you have prototypes, developmental units, and a different, final product after you get feedback from people."

The HRF Stowage Group continues to fill the Space Station racks with their hardware and stowage kits. Once regular Shuttle flights resume, scientific experiments such as the Muscle Atrophy Research Exercise System and Visuomotor & Orientation Investigations in Long-duration Astronauts will make their debut in orbit.



From left to right: Members of the Human Research Facility (HRF) Stowage Group, Phillip Good, Paul Vincent, Daniel Barineau, Sue Dalmeida and Silvia Flores, stand amid many hardware and stowage kit creations, models and prototypes in the Metabolic Laboratory.

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Volunteers send hope abroad

by Catherine E. Borsché

IT STARTED WITH A SIMPLE LETTER

published in an astronaut spouse newsletter. MaryLee Newman, living in Moscow with her husband, Astronaut James H. Newman, and their three children, volunteered her time at a government-run orphanage. While working there, she noticed the shortage of supplies such as diapers, wipes and paper towels. The heating system in the orphanage was also lacking and needed to be replaced.

"The circumstances are difficult." Newman said in the letter. "But the children are wonderful. They are happy, playful, quick to smile and to hold up their hands to be held."

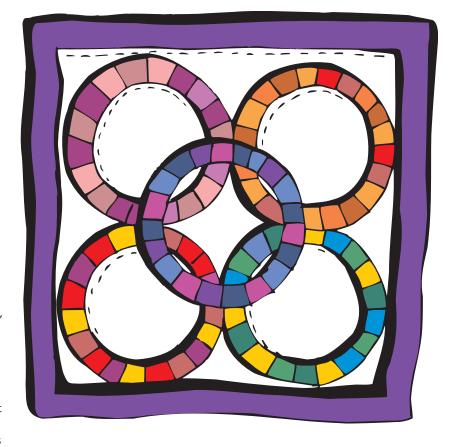
The nurses and staff at the Johnson Space Center Flight Medicine Clinic were stirred by the article and quick to respond.

Brenda Rouse, registered nurse in JSC's Flight Medicine Clinic, explained how they came up with the idea of donating guilts and blankets

to orphanages in Russia. "At the end of the letter, MaryLee Newman thanked Annie Bowersox and her friends in California that had made quilts for a brand new orphanage," Rouse said. "MaryLee added that if there was a group that wanted to do this, it would be greatly appreciated. I read that and thought, you know - we could do something like that!"

"It really touched us," Cheryl Young, JSC registered nurse, said.

Ignited with a plan appropriately called "Operation Cover Up." the JSC Flight Medicine group banded together with members of JSC Occupational Health to pull off this humanitarian effort.



Amy Trabue, receptionist for the Flight Medicine Clinic, found directions on how to make polar fleece guilts that did not require sewing. Equipped with this knowledge, all employees could take part – even if they lacked sewing skills. Many people chose to donate money to aid in the creation of the blankets.

"We all jumped on the bandwagon and agreed to participate and support Brenda in any way we could. We wanted to give something to those little guvs that we had put our hearts into. so we decided to make the blankets ourselves," Carole Porcher, head nurse in Flight Medicine, said.



Johnson Space Center's Flight Medicine group members Carole Porcher, Cheryl Young, Brenda Rouse and Amy Trabue pose with the 57 blankets that were hand-made for Russian orphanages in "Operation Cover Up."

"We all jumped on the bandwagon and agreed to participate..."

The group purchased the materials to make the blankets. The blankets, mostly made of polar fleece, are a colorful assortment of cartoon characters and designs. Some volunteers went the extra mile to hand-crochet and sew the guilts together. The stunning assortment of 57 blankets is a testament to the hard work put forth by JSC employees.

Flight Surgeons David Alexander and Sean Roden will be traveling to Russia this month and will each take extra luggage filled to the brim with the blankets.

"I volunteered to transport the items to Russia," Alexander said, "because there is a real need for this type of effort. I am just glad to be able to support it in some small way."

The blankets will be appropriately stored in vacuum-sealed "space bags" prior to being packed for travel in the flight surgeons' suitcases. Once the travel dates are picked, Flight Medicine will coordinate the blanket exchange with Newman.

The blankets were made and collected from February until the end of August. This caring venture has involved countless employees, friends and supporters - and has proven to be a resounding success.

have received has surpassed our expectations," Trabue said.

"The amount of baby blankets we

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